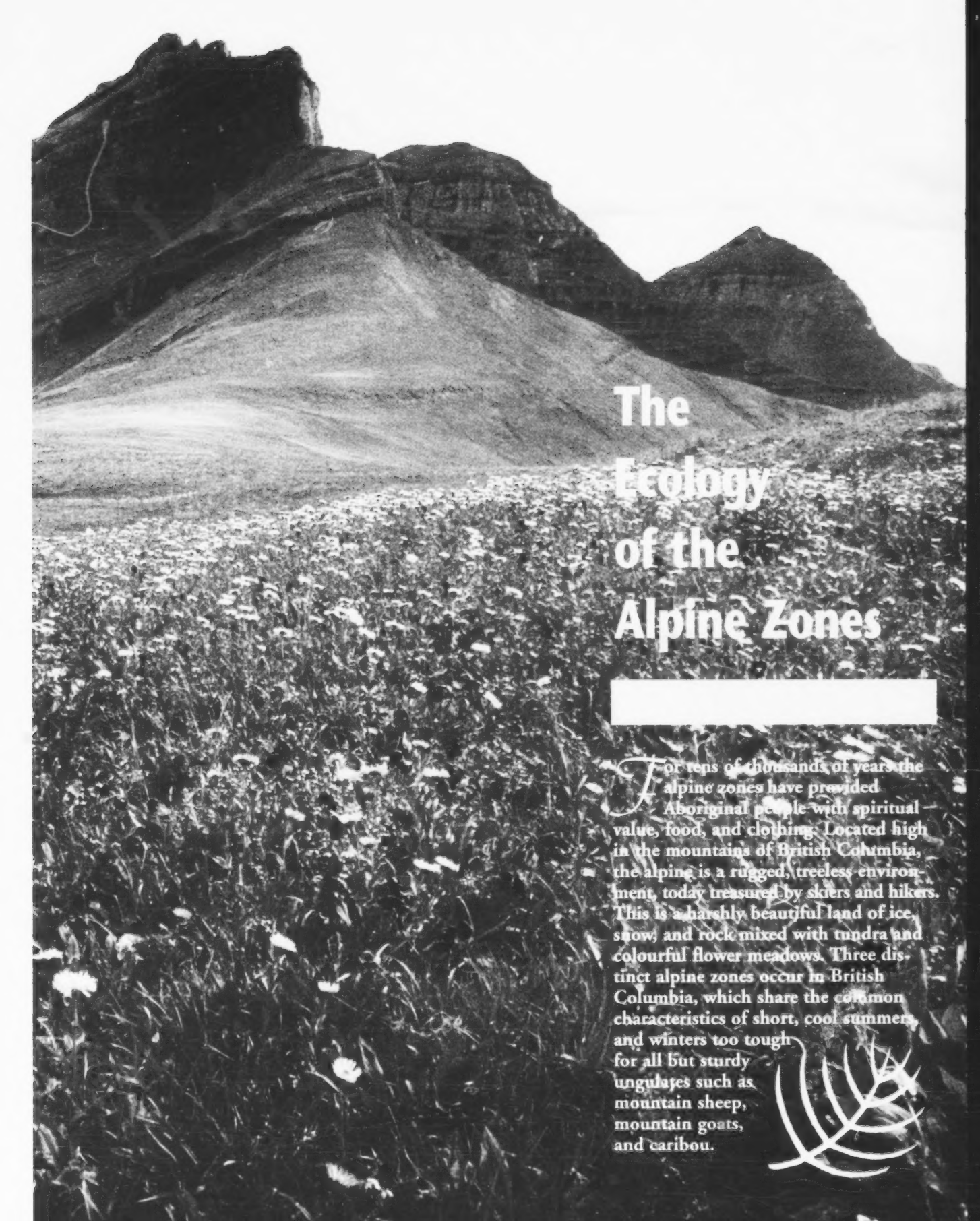
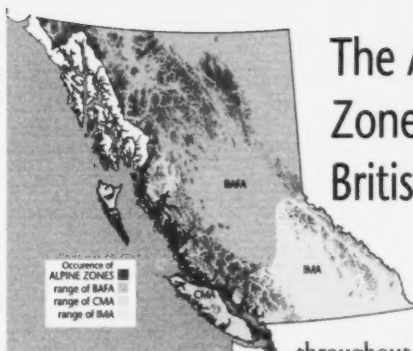




The Ecology of the Alpine Zones

For tens of thousands of years the alpine zones have provided Aboriginal people with spiritual value, food, and clothing. Located high in the mountains of British Columbia, the alpine is a rugged, treeless environment, today treasured by skiers and hikers. This is a harshly beautiful land of ice, snow, and rock mixed with tundra and colourful flower meadows. Three distinct alpine zones occur in British Columbia, which share the common characteristics of short, cool summers, and winters too tough for all but sturdy ungulates such as mountain sheep, mountain goats, and caribou.





The Alpine Zones of British Columbia

The alpine occurs at high elevations

throughout British Columbia

and has the harshest climate of any of the biogeoclimatic zones in British Columbia. Temperatures are cold for most of the year, with much wind and snow. Temperatures remain low even during the growing season, which has an exceptionally short frost-free period. Mean annual temperatures range from 0° to 4°C, and the average monthly temperature stays below 0°C from 7 to 11 months of the year. The mean temperature of the warmest month is less than 10°C. A great deal of precipitation falls in this zone, mostly as snow.

This region is separated into three alpine zones with different climate and vegetation.

The Coastal Mountain-heather Alpine (CMA) Zone occurs along the windward spine of the Coast Mountains and the mountains of Vancouver Island and the Queen Charlotte Islands where the snowpack is deep and summers are moderated by maritime influences. The treeline in this environment is lowered by heavy and prolonged snow cover and can be as much as 900 m lower than in the alpine of comparable latitudes in the dry interior. Alpine begins at 1600 m in the south, descending to 1000 m in the north. Though this zone is extensive, most of the land area is occupied by glaciers or recently exposed bare rock at the elevation of true alpine.

The Interior Mountain-heather Alpine (IMA) Zone occupies the entire Columbia Mountains, the southern Rocky Mountains, and the lee side of the Coast and Cascade Mountains. The Interior Mountain-heather Alpine is the smallest of the alpine zones since the altitude at which it begins is above the height of most of the mountain ranges: 2500 m in the dry south to 1800 m in the north. There is much precipitation variation within the zone but summers are warm relative to the other alpine zones.

The Boreal Altai Fescue Alpine (BAFA) Zone is the most extensive of the alpine zones, occupying the northern Rocky, Skeena, Omineca, and Cassiar Mountains in the north and the lee side of the Coast Mountains as far south as the Chilcotin. Winters are very cold and long, and summers are brief and cool but with very long day length. A thin windblown snowpack is typical of the Boreal Altai Fescue Alpine but deeper snowpacks occur in some areas. Ground freezing and cryoturbation (frost churning) features are common. Much of the Boreal Altai Fescue Alpine is well-vegetated alpine tundra.



Alpine above Kwinageese Lake, Strata Range

Terrain

At the high altitudes typical of this zone, the terrain is often steep and rugged, with tall cliffs and rocky, snow-capped peaks. Much of the alpine landscape is rock, ice, and snow, but some areas have extensive gently rolling terrain. Glaciers have scoured out valleys and shaped steep cliffs and valley walls. When they melted, glaciers left a variety of special alpine landforms such as basin-like cirques. Talus slopes occur where gravity has caused frost-shattered rock fragments to slide or fall down the slope. In alpine regions, the physical environment dictates the vegetation. Whether the terrain is gentle or extremely rough, the smallest differences in the microenvironment are important. Soils are typically shallow and derived from weathered bedrock. Since cold retards the process of weathering, soils develop slowly in this zone. Occasional areas of permafrost also occur here.



Wildlife

The harsh winter climate limits use of the alpine environment by wildlife in many areas. The Coastal Mountain-heather Alpine has high snowfalls and extensive ice fields and glaciers. Here, even mountain goats, which are well adapted to wintering in the alpine tundra, must descend to forested elevations. In summer, a variety of wildlife uses the alpine for forage, for breeding, and to escape predators and pests. Roosevelt elk and black-tailed deer will forage in meadows and rich tundra habitats in the lower alpine elevations. The growing season also



Hoary marmot
Marmota caligata
Will Mackenzie

sees a larger variety of birds such as the Golden Eagle and the White-tailed Ptarmigan and mammals such as the wolverine and hoary marmot. The endangered Vancouver Island marmot also occurs in coastal alpine regions. The drier parts of the Interior Mountain-heather Alpine in the east Kootenays and the lee of the Coast Mountains are home to some of the densest populations of mountain goat in the world. Ungulates such as caribou and bighorn sheep also live here. In summer and fall, elk, mule deer, and grizzly bear forage in the lush meadows.

The Boreal Altai Fescue Alpine, with its low snowfall and extensive terrain of windswept plateaus can be important winter habitat for populations of caribou, Stone sheep,



Stone sheep
Ovis dalli stonoi
Will Mackenzie

and mountain goat. Grizzly bear, gray wolf, wolverine, hoary marmot, arctic ground squirrel, and Siberian lemming also live here. Birds include ptarmigans, Blue grouse, Gyrfalcon, Horned Lark, Snow Bunting, and Rosy Finch.

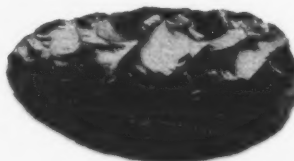


Blue grouse
Dendragapus obscurus
Will Mackenzie

Aboriginal Uses

Despite its rugged terrain and relative lack of vegetation, Aboriginal groups had many uses for the alpine tundra.

Although food was more plentiful in other zones, indigenous people of the Interior Plateau gathered the edible corms of spring beauty (Indian potato) and yellow glacier lily in alpine meadows. Aboriginal hunters also valued alpine wildlife such as mountain goat, mountain sheep, and marmots as a source of food and of materials for clothing and religious ceremonies. The stark alpine landscape also has spiritual significance for Aboriginal peoples. Unusual or startling landforms such as caves, cliffs, isolated rocks, or stone pinnacles have always had the ability to inspire reverence and fire the imagination. Examples of such "power spots" include the Giant Cleft and Stone City in Cathedral Lakes, the Man Who Turned to Stone, which sits perched on a ridge above Kitlope Lake, and several volcanic features in Mt. Edziza Park.



Knife made of Mount Edziza obsidian, from the Skeena River area, possibly 2,000 years old
BCCM



Spring beauty (Indian potato)
Claytonia lanceolata in alpine meadows.
Ray Couge

Resources

The alpine zones are a major playground of the province. Because of its mountainous terrain and high snowfall, the alpine tundra is attractive to skiers and snowmobilers. Camping, hiking, mountaineering, horse-back riding, and hunting are popular summer activities.

In certain localities in the drier alpine regions of south-central British Columbia, ranchers send their cattle and sheep in search of summer range and forage.



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Stone sheep
Ovis montanus
in the alps



Hoary marmot
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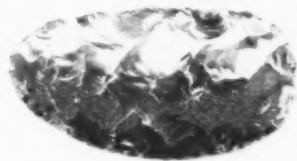


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Yellow glacier lily
Clintonia uniflora
in the alps

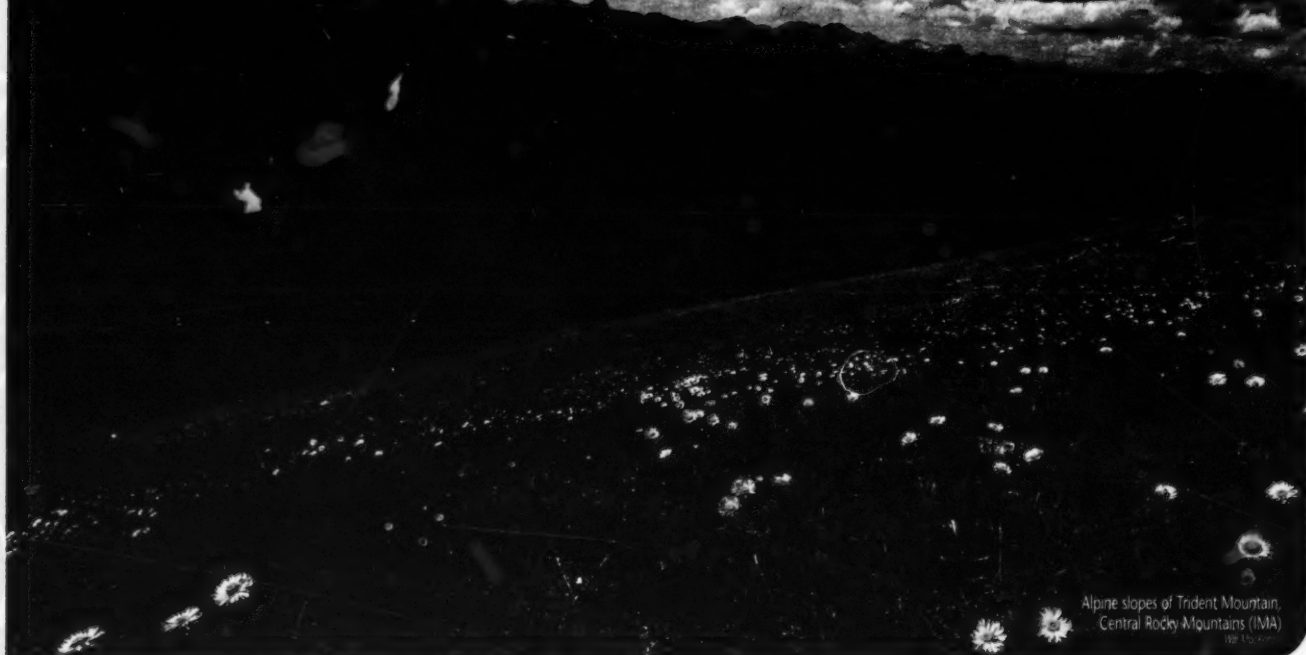


Spring beauty (Indian potato)
Claytonia lanceolata in alpine meadows.
R. L. Lister

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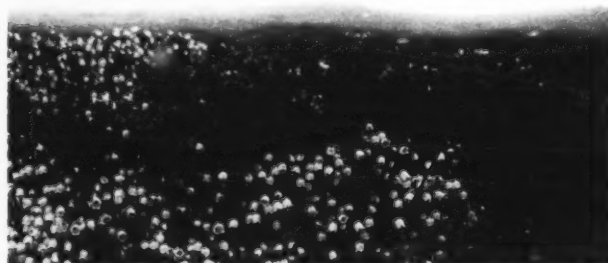




Alpine slopes of Trident Mountain,
Central Rocky Mountains (IMA)
Bill Mackenzie

Ecosystems

Vegetation in the alpine can be lush near the treeline but becomes sparser with elevation. At the treeline, the interface between the subalpine parkland and the true alpine, occurs a mosaic of stunted "krummholz" tree patches and meadow or alpine tundra. In the Coastal Mountain-heather Alpine, treeline trees are mostly mountain hemlock, yellow-cedar, and subalpine fir. The treeline of the interior is primarily spruce and subalpine fir throughout, with whitebark pine, lodgepole pine, or alpine larch occurring at some treelines of the Interior Mountain-heather Alpine. In the alpine as a whole, most zonal vegetation is made up of low-growing,



Snowbed vegetation of white, pink, and creamy mountain-heathers *Phyllodoce* spp. (CMA)
Will Mackenzie

evergreen dwarf shrubs. In the Coastal Mountain-heather Alpine, this is primarily extensive beds of white and pink mountain-heathers. The Boreal Altai Fescue Alpine vegetation, in contrast, is primarily dwarf willows, grasses, sedges, and lichens. The Interior Mountain-heather Alpine vegetation is variable, with mountain-heathers typical in snowier climates and mountain-avens typical in the driest climates. Snow depth is one of the most important factors influencing plants in the alpine.

Topography leads to differential erosion or deposition of snow and even a few centimetres difference in topography

can have a pronounced effect on factors that influence plants – soil temperature, moisture, depth of thaw, and exposure to wind. The result is a complex mosaic of vegetation and soil types.

Colourful herb meadows are a familiar feature of the alpine landscape at the treeline where soils are deeper, along alpine rivulets, and especially in snowier climates. These lush mountain meadows feature a spectacular display of showy-flowered broad-leaved herbs such as arctic lupine, arrow-leaved



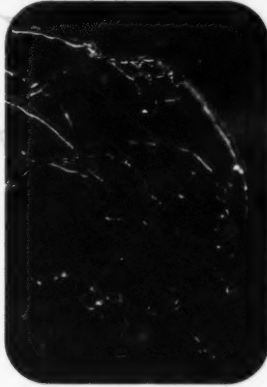
Rocky peak vegetation in the Skeena Mountains (BAFA)
Will Mackenzie

groundsel, subalpine daisy, Sitka valerian, Indian hellebore, arnicas, cow-parsnip, cinquefoils, louseworts, paintbrushes, western pasqueflower, white marsh-marigold, glacier lily, buttercups, mountain sorrel, and mountain sagewort.

In the interior, communities of mountain-avens, saxifrage, dwarf cinquefoils, moss-campion, and others occur primarily on windswept, largely snow-free ridge crests, along with lichen and other mat-forming herbs. Species differ between the Boreal Altai Fescue Alpine and Interior Mountain-heather Alpine. Similarly, a wide variety of alpine grasses and sedges are common in dry alpine tundra. Dominant grasses and sedges vary from north to south, but commonly include several species of fescue, wheat grasses and blue-grasses, alpine sweet grass, timber oatgrass, fuzzy-spiked wildrye, and various sedges. In regions with higher snowfall, grassy tundra usually appears only on steep, south-facing slopes or windy ridge crests. However, some seepage or snowbed ecosystems support a variety of grasses or sedges that thrive on wetter conditions. Common species in wetter alpine communities include black alpine sedge, showy sedge, and, on the wettest sites, cotton-grasses.

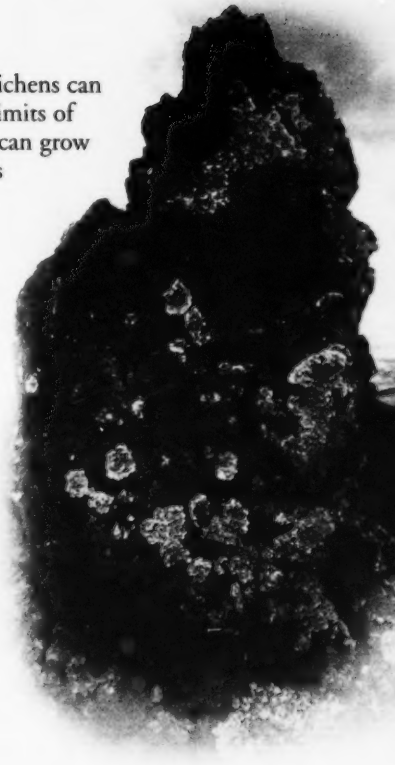
Plant Adaptation

The lower alpine has an abundance of alpine and montane species, but few flowering plants can survive the harsh conditions of the highest alpine. Some species are able to thrive in extreme alpine environments by forming ground-hugging cushions or mats. These plants include moss campion and several species of sandwort, saxifrage, and whitlow-grass. Others plants have fuzzy or hairy leaves that help to trap air, reduce water loss, and insulate them from the cold dry winds. Examples are cinquefoil, woolly pussytoes, lupines, and silky phacelia.



Ice-coated spiked wood-rush *Luzula spicata*
Will MacKenzie

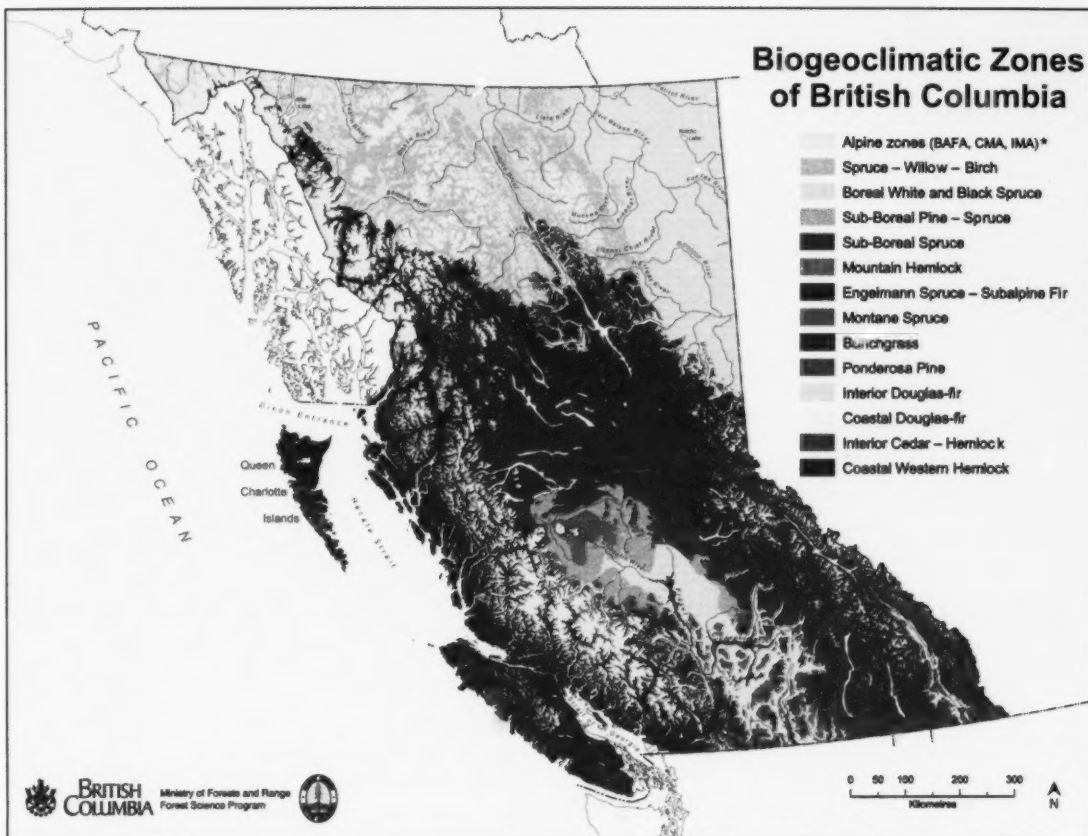
Mosses, liverworts, and lichens can also thrive at the upper limits of vegetation. These plants can grow over bedrock, in fellfields (boulder fields), or as stripes of vegetation on frost-patterned ground. Some of the lichen tundra, especially on limestone, is surprisingly colourful and rich in species diversity.



Alpine rock lichens
Will MacKenzie



Snowbed vegetation of Mountain-heathers and black alpine sedge in the Northern Columbia mountains
Will MacKenzie



The alpine zones are three of 16 biogeoclimatic or ecological zones within British Columbia. These zones are large geographic areas that share a similar climate within the province. Brochures in this series explore each zone.

* The colours used to distinguish the alpine zones (BAFA, CMA, IMA) are only found on large scale maps, such as 1:250,000.



Ministry of Forests and Range
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For more information on this, and other zone brochures,
see <http://www.for.gov.bc.ca/hfd/pubs/Bro.htm>

